

# **U.S Army Installation Management Command**

## **Environmental Radiation Monitoring Plan For Depleted Uranium From the M101 Spotting Round**

*Enclosure 2*

**U.S Army Installation Management Command**  
**Generic Environmental Radiation Monitoring Plan**  
**For Depleted Uranium**  
**From the M101 Spotting Round**

**1. Purpose.** This Environmental Radiation Monitoring (ERM) Plan establishes the program for evaluating the off-range migration of depleted uranium (DU) from Army ranges with DU residue resulting from the M101 Spotting Round. This plan establishes the minimum requirements for installations where the M101 Spotting Round was used and will be supplemented by site-specific ERM plans, as applicable.

**2. Scope.** This ERM Plan encompasses all Army Installations regulated by the Nuclear Regulatory Commission (NRC) for the possession of DU resulting from the use of the Cartridge, 20mm Spotting M101 associated with the Davy Crockett Light Weapon M28. This round was used between 1962 and 1968. The DU from this system has remained undetected on Army ranges until discovery in 2005. The DU can be found in sizes ranging from nearly intact rounds to small particles.

**3. Responsibilities.**

a. Installation Management Command (IMCOM) Radiation Safety Officer (RSO). The IMCOM RSO has overall program responsibilities for ensuring the ERM Plan is managed in accordance with the NRC guidelines as specified in the NRC License and associated documentation. This includes but is not limited to the following:

(1) Prepare site-specific ERM plans and keep them current. ERM plans will characterize conditions at each site, identify potential exposure pathways, identify changes in site use, and identify any off range migration of DU to the surrounding environment.

(2) Ensure that quality assurance procedures are being implemented according to the general format in NRC Regulatory Guide 4.15.

(3) Review environmental sampling data to ensure that action levels are not exceeded. If exceeded, take action to notify the NRC, evaluate the cause, and recommend appropriate actions to the IMCOM Commander or responsible official.

(4) Maintain documentation (to include all ERM plans and sampling data) and provide reports as required to higher headquarters.

b. Local Radiation Safety Officer (LRSO). The LRSO will ensure that the site is managed in accordance with the NRC guidelines as specified in the NRC License and associated documentation. This includes but is not limited to the following:

(1) Ensuring that ERM Plan requirements are conducted as specified. This could include providing assistance to the installation environmental office, or performing the sampling if environmental specialists are not available.

(2) Informing the IMCOM RSO of changes that occur at the site that could necessitate revision of the ERM Plan or off-site transport of contaminants.

**4. Criteria for Establishing an Environmental Radiation Monitoring Program.** A site-specific ERM plan will be prepared for each site possessing DU from the M101, unless DU is previously authorized by another NRC License at that site, in which case the existing license and ERM plan will continue to be used. Each ERM plan will comply with these requirements unless specifically exempted. The site-specific ERM plans will be prepared in accordance with the guidelines in NUREG-0475, *Radiological Environmental Monitoring by NRC Licenses for Routine Operations of Nuclear Facilities*, and NRCP Report No. 50, *Environmental Radiation Measurements*, Regulatory Guide 4.15, *Quality Assurance for Radiological Monitoring Programs – Effluent Streams and the Environment*. The ERM plan will contain at a minimum the following information:

a. Site Description. The site description will describe the general geography, geological, and hydrological conditions present at the site. This information may be extracted from existing environmental documents for the site, such as an Environmental Impact Statement or Operational Range Assessment Report. It will provide, or provide a suitable reference to, information sufficient to evaluate potential exposure pathways and mechanisms for off-range transport.

b. Pathway Analysis. Each site-specific ERM plan will evaluate potential exposure pathways to identify credible links between potential DU sources and human and environmental targets. This analysis may also include an evaluation of intermediary sources such as plants, animals and fish in addition to direct exposure pathways. The pathway analysis will include the types of operations that may occur in the area and changes that could impact the environmental conditions on the site. This analysis will consider the following environmental media: air, soil, and surface water. Direct external radiation exposure is not usually relevant for this ERM plan, but will be considered if applicable.

c. Environmental Sampling. Based on the pathway analysis, each site-specific ERM plan will include a description of the type of sampling to be performed, the frequency of sampling, and location of the samples. Rationale for establishing these sampling methods and locations will be provided along with the rationale for any sampling methods that are excluded. Sampling locations will be biased towards locations most likely to quantify the degree of off-range migration of contaminants, while maintaining safety for the sample collector. The boundary of the affected range is

considered the default position. Sampling will occur at the range boundary or an justification will be provided if another area is selected. Background DU concentrations in soil and surface water from a non-impacted reference site or sampling location will also be conducted if the site has not been previously characterized for DU.

d. **Sample Analysis.** Analysis will be performed by a qualified laboratory, such as the U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM) or commercial equivalent. Procedures used for sample analysis will be U.S. Environmental Protection Agency (USEPA) Method 200.8, *Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma - Mass Spectrometry* or equivalent procedure and USEPA Method 6020 *Inductively Coupled Plasma - Mass Spectrometry*. Results will be reported in terms of activity per gram for each isotope and total activity for uranium. Additional procedures may be used if a different type of sample is chosen, but an approved standard method such as the above may be chosen as long it is in compliance with NUREG-0475. The analytical technique will be capable of a lower limit of detection that does not exceed 5% of the applicable action level.

e. **Action Levels.** The purpose of analyzing soil, sediment, and surface water is to ensure that releases of material to the environment are as low as reasonably achievable (ALARA). Every effort will be made to maintain radiation exposures and release of radioactive materials to unrestricted levels or ALARA. Action levels are provided to establish a limit which, if exceeded, will require initiation of a characterization effort and, development of appropriate mitigative measures. Based on the results of the investigation, the IMCOM RSO will recommend corrective actions to be undertaken. Action levels are defined in the table below:

<b>Environmental Media</b>	<b>Action level</b>
<b>Soil</b>	<b>35 picocuries/gram (pCi/g)</b>
<b>Sediment</b>	<b>35 picocuries/gram (pCi/g)</b>
<b>Surface Water</b>	<b>150 picocuries/liter (pCi/l)</b>

These action levels are derived from the NRC *Branch Technical Position on Disposal or Onsite Disposal of Thorium or Uranium Wastes from Past Operations* for soil and sediment and 10 CFR 20.1301 (50% of 10 CFR 20, Appendix B, Table 2) for surface water. If analytical results are below the action level, no action will be taken. If an action level is exceeded for one or more environmental media, an investigation will be initiated to determine the cause, corrective actions will be recommended, and the NRC will be notified.

## REFERENCES

NCRP 1976, *Environmental Radiation Measurements*, NCRP Report No. 50, National Council on Radiation Protection and Measurements.

NRC 1978, *Radiological Environmental Monitoring by NRC Licenses for Routine Operations of Nuclear Facilities*, NUREG-0475, Nuclear Regulatory Commission, September 1978.

NRC 1981, *Branch Technical Position on Disposal or Onsite Disposal of Thorium or Uranium Wastes from Past Operations*, 46 FR 52061-3, Nuclear Regulatory Commission, September 1981.

NRC 2007, *Quality Assurance for Radiological Monitoring Programs – Effluent Streams and the Environment*, Regulatory Guide 4.15 Nuclear Regulatory Commission, September 1978.

NRC 2007, *Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other than Power Reactors*, Regulatory Guide 4.20, Nuclear Regulatory Commission, September 1995.

US Army 2009, Department of the Army Pamphlet, 385-10, *The Army Radiation Safety Program*.

USEPA 1999, *Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma - Mass Spectrometry*, Method 200.8.

USEPA 1992, *Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by Graphite Furnace Atomic Absorption (GFAA) Spectroscopy*, Method 3020A, July 1992.

USEPA 1994, *Determination of Metals and Trace Elements in Soils by Inductively Coupled Plasma - Mass Spectrometry*, Method 6020, SW-846. September 1994.

USEPA 1996, *Microwave Assisted Acid Digestion of Siliceous and Organic Based Matrices*, EPA SW 3052, December 1996.